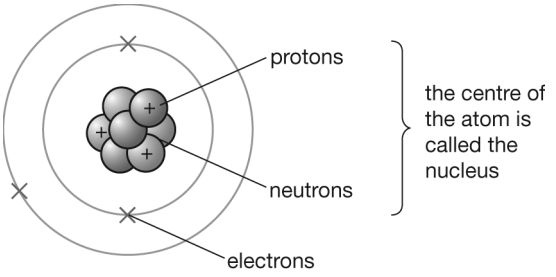
C2a answers

Remember: Check which grade you are working at.

Page 90 Atomic structure 2

1 a



(4)

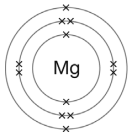
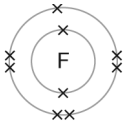
b A electron *(1)*

B proton *(1)*

C neutron *(1)*

Page 90 Electronic structure

2 a

Periodic table element	$^{23}_{11}$Na sodium	$^{24}_{12}$Mg magnesium	$^{19}_{9}$F fluorine
Number of electrons	11	12	**9**
Electron arrangement			
Notation	2, 8, 1	**2, 8, 2**	**2, 7**

For Mg: draw correctly on diagram = (1) written correctly as 2, 8, 2 = (1)
For F: correct number of electrons = (1) draw correctly on diagram = (1) written correctly as 2, 7 = (1)

b 2, 8 *(1)*

Page 91 Mass number and isotopes

1 Both same number / 7 electrons in the outer shell *(1)*

Page 91 Ionic bonding

2 a Sodium *(1)*

b Metal; positive, loses *All three correct = (2) 2 correct = (1)*

3 a Ca^{2+} *(1)*

b $CaCl_2$ *(1)*

C2a answers

Page 92 Ionic compounds

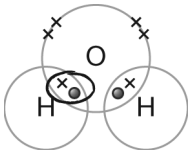
1 a C *(1)*; because it is grey and shiny *(1)*; and it conducts electricity when it is a solid *(1)*
(a high melting point does not show that it is a metal, because other types of solids also have high melting points)

b A *(1)*; because it conducts electricity when it is melted *(1)*; but does not conduct when it is a solid *(1)* (The fact that it is a white solid also gives a clue but it isn't the 'best' answer.)

c Because it has a low melting point

Page 92 Covalent bonding

2 a



Ring around a pair of electrons shared between oxygen and hydrogen = (1)

b *6 (1)*

3 a Double *(1)*

b 4 shared electrons *(1)*

c Oxygen atoms have 6 electrons in their outer shell *(1)*; so need to gain two electrons to form a stable arrangement *(1)*

Page 93 Simple molecules

1 A few; covalent; strong; gases *All four correct = (3) 3 correct = (2) 2 correct = (1)*

Page 93 Giant covalent structures

2 Giant *(1)*; covalent *(1)*

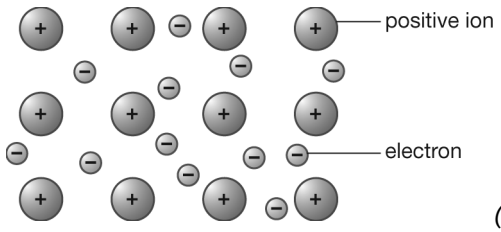
3 Graphite has weak bonds between layers *(1)*; layers can break off *(1)*; all bonds in diamond are very strong *(1)*

Page 94 Metals

1 a i *(Any 2:)* Low melting point; liquid at room temperature; flows over surfaces

ii Very dense *(2)*

2 a



(2)

b Electrons can move *(1)*

c C *(1)*

Page 94 Alkali metals

3 a Sodium *(1)*; sodium chloride *(1)*

b Loses one electron *(1)*

C2a answers

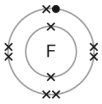
Page 95 Halogens

1 a

Name of halogen	Formula	State at room temperature	Colour
Fluorine	**F_2**	Gas	Colourless
Chlorine	Cl_2	Gas	**Pale yellow/green**
Bromine	Br_2	**Liquid**	Dark red
Iodine	I_2	Solid	Black

(3)

2 a



8 electrons drawn in outer shell = (1)

b –1 *(1)*

c Sodium *(1)*

Page 95 Nanoparticles

3 a Hundreds; tiny, surface area *All three correct = (2) 2 correct = (1)*

b *(Any 2:)* The coat is harder wearing and does not get dirty; therefore it will last longer than a normal coat; and will not need to be washed / cleaned as often

c Companies invest in new research that might make profits in the future; nanoparticles have many uses that can be sold to make money; *(*examples of uses of nanoparticles:*)* biosensors; harder wearing / stain resistant materials; information processors; catalysts

Page 96 Smart materials

1 A spectacles; D car dials; B helmet; C mugs *All correct = (4) 2/3 correct = (2) 1 correct = (1)*

Page 96 Compounds

2 a i *2 (1)*

ii Only contains one type of atom / all the atoms are the same *(1)*

b i *5 (1)*

ii Carbon *(1)*; hydrogen *(1)*

3 a Elements contain only one type of atom *(1)*; compounds contain more than one type of atom chemically joined together *(1)*

b *(Any 3:)* In a mixture the elements are not chemically joined together; in a compound the elements are chemically joined together; mixtures have different properties to the compounds of the same elements; for example, hydrogen and oxygen are gases, water is a liquid

C2a answers

Page 97 Percentage composition

1 a 32 *(1)*; 48 *(1)*

2 a Compound A is CO *(1)*; compound B is CO_2 / CO / CO_2 *(1)*

b Compound B contains a higher percentage than A *(1)*

Page 97 Moles

3 a 64 *(1)*; 64 g *(1)*

b Yes it is true *(1)*; because there is twice as much SO_2 as S in the calculation:
64 ÷ 32 = 2 *(1)*

c Mass of oxygen in SO_2 = 32

Percentage mass of sulfur in SO_2 = (64 ÷ 32) x 100 *(1)*
= 50 % *(1)*

Page 98 Percentage yield

1 a Theoretical yield *(1)*

b *(Any 2:)* Some of the magnesium oxide has been lost; not all the magnesium has reacted; the original magnesium may not have been pure; Rose may have made some errors in her measurements; detail of where the magnesium oxide is lost e.g. during heating / when Rose carried the crucible to the balance

2 a C *(1)*

b *(Any 2:)* Makes more product; less reactants wasted; saves energy / fuel

Page 98 Reversible reactions

3 a Reversible *(1)*

b Pink; blue; pink *All three correct = (2) 2 correct = (1) allow (1) mark for blue pink blue*

Page 99 Equilibrium 1

1 a hydrogen + **iodine** $\rightleftharpoons$ **hydrogen iodide**
Iodine and hydrogen iodide in correct places = (1) correct sign for reversible reaction = (1)

b Reaction goes in both directions *(1)*; so there is always a mixture of products and reactants / always some reactants left *(1)*

2 a A *(1)*

b Catalyst *(1)*

c *(Any 2:)* Reaction is reversible; do not get 100% yield; recycling gases means more will react / better yield

Page 99 Haber process

3 a Nitrogen *(1)*

b Methane *(1)*

c i Speeds up the reaction *(1)*

ii Speeds up the reaction *(1)*; gives a higher yield *(1)*

C2b answers

Remember: Check which grade you are working at.

Page 101 Rates of reactions

1 a Solution goes blue; bubbles form; magnesium is used up *All three = (2) 1 or 3 correct = (1)*

b i Bubbles / fizzing *(1)*

ii pH indicator goes blue / is no longer red *(1)*

c Idea that reaction is faster; (example of what will be seen:) faster colour change / faster fizzing / magnesium used up faster *(1)*

Page 101 Following the rate of reaction

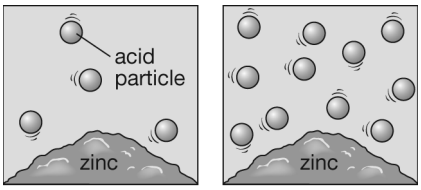
2 a Time *(1)*; volume of gas *(1)*

b No more gas will be made *(1)*

c Mass *(1)*

Page 102 Collision theory

1 a



Box A Box B

More acid particles shown than in box A = (1)

b *(Any 2:)* increase temperature; smaller zinc pieces / increased surface area of zinc
Allow use a catalyst, but this is not the best answer here

c Collide; energy *Both correct = (1)*

Page 102 Heating things up

2 a Flask loses mass / gets lighter *(1)*; because reaction produces carbon dioxide *(1)*; which is a gas / leaves the flask / is lost *(1)*

b *(Any 3* at a higher temperature:*)* particles have more energy / move about faster; collisions are more frequent; more particles have enough energy to react; there are more successful collisions

Page 103 Grind it up, speed it up

1 a B *(1)*

b A *(1)*

c Surface area *(1)*

d Mass falls *(1)*; flask gets lighter *(1)*

Page 103 Concentrate now

2 a The acid *(1)*

b No more fizzing *(1)*; no more mass change *(1)*

c Acid is being used up; concentration of acid falls; reactions are slower at lower concentrations *(3)*

C2b answers

Page 104 Catalysts

1 a Hydrogen peroxide → water + oxygen *(1)*

b Experiment takes a very long time / would have to sit and watch for a very long time *(1)*

c i Reaction would be faster *(1)*

ii Manganese (IV) oxide acts as a catalysts *(1)*

2 a i It is not used up *(1)*

ii *(Any 2:)* They have a very long lifetime / are not used up; they make reactions faster; (link to cost:) more products made quickly / do not need to buy more catalyst very often / works out cheaper over time

Page 104 Energy changes

3 a

Reaction	Temperature change	Exothermic or endothermic?
Dissolving ammonium nitrate in water	Decreases	**Endothermic**
Adding zinc powder to copper	**Increases**	Exothermic
Adding magnesium ribbon to an acid	Increases	**Exothermic**

All three correct = (2) 1 or 2 correct = (1)

b Oxidation *(1)*; neutralisation *(1)*

Page 105 Eqilibrium 2

1 a ⇌ *(1)*

b Ice melts *(1)*

Page 105 Industrial processes

2 a Nitrogen + hydrogen ⇌ ammonia *Correct names = (1) reversible sign correct = (1)*

b i Acts as a catalyst *(2)*

ii Increased surface area *(1)*; makes the reaction faster *(1)*

c i Nitrogen; hydrogen *Both correct = (1)*

ii It is reversible / it reaches equilibrium *(1)*

3 a 10% *(1)*

b Decreases; increases; slower; faster *All four correct = (3) 2 or 3 correct = (2) 1 correct = (1)*

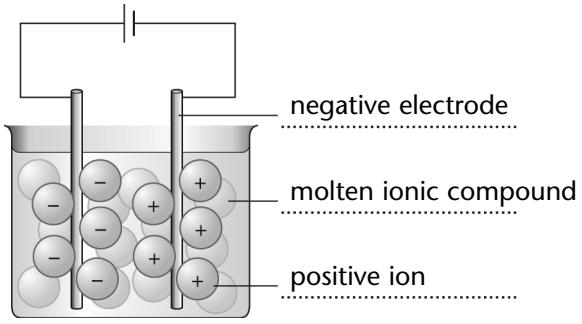
C2b answers

Page 106 Free ions

1 a Lithium *(1)*; chloride *(not chlorine) (1)*

b LiCl(s) *(1)*

2 a



(3)

Page 106 Electrolysis equations

3 a Idea of attraction *(1)*; between opposite charges *(1)*

b Chlorine *(1)*

c Gain; 0; reduced *All three correct = (2) 2 correct = (1)*

Page 107 Uses for elctrolysis

1 a

At the positive electrode	At the negative electrode	Left behind in solution
Chlorine	Hydrogen	Sodium hydroxide

All three in correct places = (2) 1/2 in correct places = (1)

b B *(1)*

2 a When copper is purified, both electrodes are made from **copper**. A block of impure copper is use as the **positive** electrode. Copper ions from the solution form pure copper by **gaining** two electrons. *(3)*

b The concentration of Cu^{2+} ions stays the same *(1)*; because they go into solution from the impure copper electrode and leave the solution at the pure electrode *(1)*

Page 107 Acids and metals

3 a *(Any 2:)* Magnesium; zinc; lead

b At the bottom *(1)*; it is very unreactive / less reactive than silver *(1)*

c Hydrochloric acid *(1)*

C2b answers

Page 108 Making salts from bases

1 a Sulphuric acid *(1)*

b Zinc oxide *(1)*

c Filtering *(1)*

2 a Copper chloride *(1)*; water H_2O *(1)*

b Idea that this adds excess / too much *(1)*; to make sure all the acid is used up / has reacted *(1)*

Page 108 Acids and alkalis

3 a From **blue** to **red** *(1)*

b It only has two colours / needs to be different colours at different pHs idea *(1)*

c i Use the indicator to find out how much acid he needs to add *(1)*; repeat without indicator *(1)*; using same amounts of acid and alkali *(1)*

ii By evaporating the solution *(1)*

Page 109 Neutralisation

1 a Lemon juice *(1)*

b Fresh milk *(1)*

c Take a sample of milk *(1)*; add Universal Indicator solution / dip in some UI paper *(1)*; compare the colours to the chart / if it is orange-yellow it is sour / if it is blue-green it is not sour *(1)*

Page 109 Percipitation

2 a i Lead nitrate / potassium chromate *(1)*

ii Lead chromate *(1)*

b Potassium nitrate *(1)*

3 a i Lead carbonate *(1)*

ii Calcium phosphate *(1)*

b The water can be filtered to remove the precipitate *(1)*